

REMARKSSummary

This Amendment is responsive to the Office Action mailed on December 16, 2002. Claims 1 and 15 are amended herein. Claims 1-28 are pending.

The Examiner has objected to the specification based on an informality, namely that the meaning of "FLC-on-CMOS" on page 9, line 12 must be disclosed. The specification is amended herein to specify that FLC stands for "Ferro-electric Liquid Crystal" which is a particular variation of a liquid crystal display material and driving mode, as is commonly known in the art. Applicants respectfully request withdrawal of the objection to the specification.

Claims 1-2, 7-16, and 21-28 stand rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Henley (US 5,459,410) in view of Kurogane (US 6,259,424).

Claims 3-4, 17-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Henley and Kurogane in view of Yamakazi (US 6,147,667).

Claims 5 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Henley and Kurogane in view of Yang (US 6,392,427).

Claims 6 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Henley and Kurogane in view of Anholm (US 5,043,655).

Applicants respectfully traverse the foregoing rejections in view of the following comments.

Discussion of Amended Claims

Independent claims 1 and 15 are amended herein to specify that the pixel drive circuitry comprises CMOS drive circuitry

(see, e.g., Applicants' specification, page 9).

Discussion of the Combination of Henley

Henley discloses a method for repairing inoperative pixels by providing redundant TFT drive circuitry for each pixel (Col. 12, lines 13-41).

In contrast, the present invention relates to repair of defective pixels having CMOS drive circuitry. With the present invention, logical repair of the defective pixel is accomplished while avoiding the overhead of a redundant drive circuit as used by Henley.

Redundant drive circuitry introduces several disadvantages that the present invention overcomes (as is explained in the background section of Applicants' specification). One large disadvantage is the complexity of routing the signals from the redundant circuitry to the defective pixel. The connection path between the redundant drive circuitry and all the possible pixels it can be used to repair has to be accommodated. Wires that span large numbers of pixels, columns, or rows tend to exhaust the available routing paths, perhaps requiring additional interconnects between metal layers, larger pixel pitch, and the like.

Alternatively described in the prior art, a trade-off to routing the signals from the redundant drive circuitry to large numbers of pixels is to have localized redundant drive circuits that serve a smaller number of pixels (in the extreme, one redundant circuit per pixel as described in Henley). Such a larger number of redundant drive circuits consumes area on the silicon chip that could be instead used for more complex drive circuits per pixel. Such redundancy will also increase the size and cost of the device. In the extreme case of one redundant circuit per pixel as disclosed in Henley, the increase results in

doubling the number of circuits.

In TFT LCDs as disclosed in Henley, the redundant circuitry can also impact fill factor and minimum pixel size since the transistors and interconnections are relatively large compared to the pixels in this technology and obscure some of the light-passing portion of the pixel area.

Additionally, when using redundant circuitry to effect pixel repairs as in Henley, the input data to be displayed has to be routed to the correct redundant circuit, introducing even more complexity.

As admitted by the Examiner on page 2 of the Office Action, Henley does not disclose or remotely suggest repairing a defective pixel by connecting an inoperative pixel to the working drive circuitry of a nearby pixel, as set forth in Applicants' claims.

Discussion of Kurogane

The Examiner indicates that Kurogane discloses connecting the driver of one pixel to fix a defect in another pixel (Office Action, page 2). Kurogane discloses a process for building an LCD display using TFT technology. In Kurogane, a defective transistor 1A is not electrically connected to the pixel electrode 2A, and the pixel electrode 2A of the defective pixel 21 A is electrically connected to the pixel electrode of the adjacent normal pixel 22B (Col. 9, lines 57-64: Figure 7).

The disclosure of Kurogane is limited to connecting the defective pixel to the drive of an immediately adjacent pixel. In contrast, the present invention is not limited to immediately adjacent pixels. The methods and apparatus of the present invention are suitable for connecting the repaired pixel to other pixel drives besides that of immediately adjacent pixels.

Kurogane is in the field of LCD displays built using TFT

technology. Applicants' amended claims are directed towards repairing defective pixels having defective CMOS drive circuitry.

The present invention is a practical solution to repairing defective pixels where more complex CMOS drive circuits are employed. The method of Kurogane is not directly suitable for use in a CMOS IC production process. Even though reflective MOS microdisplays are mentioned in Kurogane, the repair process described in Kurogane of creating a custom etching mask for each unit to be repaired is likely an order of magnitude more expensive than the cost of making each unit. A complete mask set for a CMOS IC can cost hundreds of thousands of dollars, even millions of dollars. Thus the feasibility of the required preliminary testing and repair steps of Kurogane is not feasible for displays having CMOS drive circuitry.

Kurogane mentions MOS microdisplays in passing only and no specific details are given as how to apply this art to the field of CMOS microdisplays as claimed by Applicants.

Further, Kurogane's disclosure is related to a method or process of building the display. The present invention is concerned with the in-advance design of the display such that it can be easily repaired or modified after it is built.

The examiner has indicated that it would have been obvious to combine the disclosure of Henley with that Kurogane to arrive at the claimed invention. However, Applicants respectfully submit that a straight-forward combination of these technologies would not have been obvious to one skilled in the art at the time of Applicants' invention. Neither Henley nor Kurogane relate to repair of defective pixels having defective drive circuitry as claimed by Applicant.

Further, Kurogane uses a detection and repair strategy during a preliminary production process, not after the device is manufactured as is disclosed in Henley. As discussed above, Henley accomplishes the repair using redundant circuitry. To

combine Henley and Kurogane to arrive at the present invention would require that the disadvantages of using redundant circuitry of Henley be removed, in addition to overcoming the preliminary detection and repair process required by Kurogane. Neither reference teaches how to overcome these issues. The combination Kurogane and Henley taken as described (and in the absence of the teachings of the present invention) is insufficient to result in the functionality embodied in our invention without further creative thought.

The specific descriptions and reduction to practice Kurogane and Henley are too complex and disparate for it to have been obvious how to lift the top level concepts mentioned by the Examiner and to combine them to arrive at the present invention.

Therefore, only with hindsight gained impermissibly from Applicants' disclosure could one of ordinary skill in the art have arrived at the claimed invention from the combination of Kurogane and Henley. Moreover, there are no detailed teachings in either of these prior art references that would have motivated or enabled one skilled in the art to combine them as suggested by the Examiner.

Applicants respectfully submit that the present invention would not have been obvious to one skilled in the art in view of the combination of Henley and Kurogane, or any of the other prior art of record.

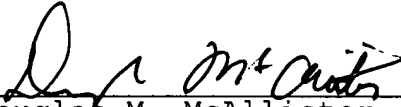
Withdrawal of the rejections under 35 U.S.C. § 103(a) is therefore respectfully requested.

Further remarks regarding the asserted relationship between Applicants' claims and the prior art are not deemed necessary, in view of the above discussion. Applicants' silence as to any of the Examiner's comments is not indicative of an acquiescence to the stated grounds of rejection.

Conclusion

In view of the above, the Examiner is respectfully requested to reconsider this application, allow each of the presently pending claims, and to pass this application on to an early issue. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicants' undersigned attorney.

Respectfully submitted,



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